

AD-A193 010

UNIVERSITY - INSTRUMENTATION-RESEARCH-PROGRAM:
COMPUTER-AIDED STUDY OF ST. (U) WISCONSIN UNIV-MADISON
W S RHODE 06 MAY 87 AFOSR-TR-88-0302 AFOSR-85-0049

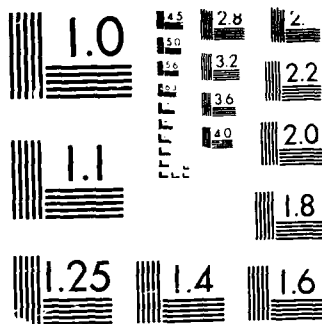
1/1

UNCLASSIFIED

F/G 6/5

NL





MICROCOPY RESOLUTION TEST CHART
 (10X) NATIONAL BUREAU OF STANDARDS-1963-A

REPORT DOCUMENTATION PAGE

DTIC FILE COPY

UNCLASSIFIED

SECURITY CLASSIFICATION AUTHORITY

DECLASSIFICATION / DOWNGRADING SCHEDULE

PERFORMING ORGANIZATION REPORT NUMBER(S)

NAME OF PERFORMING ORGANIZATION

University of Wisconsin

ADDRESS (City, State, and ZIP Code)

281 Medical Sciences Bldg
1300 University Avenue
Madison WI 53706NAME OF FUNDING / SPONSORING
ORGANIZATION
AFOSROFFICE SYMBOL
(If applicable)OFFICE SYMBOL
(If applicable)
NL

RESTRICTIVE MARKINGS

DISTRIBUTION / AVAILABILITY OF REPORT

Approved for public release; distribution
unlimited.

MONITORING ORGANIZATION REPORT NUMBER(S)

AFOSR-TR- 88 - 0202

NAME OF MONITORING ORGANIZATION

Air Force Office of Scientific Research/NL

ADDRESS (City, State, and ZIP Code)

Building 410
Bolling AFB, DC 20332-6448

PROCUREMENT INSTRUMENT IDENTIFICATION NUMBER

AFOSR-85-0049

ADDRESS (City, State, and ZIP Code)

Building 410
Bolling AFB, DC 20332-6448

SOURCE OF FUNDING NUMBERS

PROGRAM
ELEMENT NO

61102F

PROJECT
NO

2917

TASK
NO

A4

WORK UNIT
ACCESSION NO

TITLE (Include Security Classification)

DOD-UNIVERSITY INSTRUMENTATION PROGRAM FY85 (841863)

PERSONAL AUTHOR(S)

Dr William S. Rhode

TYPE OF REPORT

Final

TIME COVERED

FROM 15 Dec 84 to 14 Dec 85

DATE OF REPORT (Year, Month, Day)

May 6, 1987

PAGE COUNT

4

SUPPLEMENTARY NOTATION

COSATI CODES

FIELD

GROUP

SUB-GROUP

SUBJECT TERMS (Continue on reverse if necessary and identify by block number)

ABSTRACT (Continue on reverse if necessary and identify by block number)

SEE REPORT ATTACHED

DTIC
ELECTE
MAR 30 1988
S D

DISTRIBUTION / AVAILABILITY OF ABSTRACT

☒ UNCLASSIFIED/UNLIMITED ☒ SAME AS RPT ☐ DTIC USERS

ABSTRACT SECURITY CLASSIFICATION

UNCLASSIFIED

NAME OF RESPONSIBLE INDIVIDUAL

WILLIAM O. BERRY

TELEPHONE (Include Area Code)

(202) 767-5021

OFFICE SYMBOL

NL

AFOSR-TR- 88 - 0802

| | |
|--------------------|-------------------------------------|
| Accession For | |
| NTIS CRARI | <input checked="" type="checkbox"/> |
| DTIC TAB | <input type="checkbox"/> |
| Unannounced | <input type="checkbox"/> |
| Justification | |
| By | |
| Distribution/ | |
| Availability Codes | |
| Dist | Available for Special |
| A-1 | |

Final Report

AFOSR-85-0049

University - Instrumentation-Research-Program

P.I. William S. Rhode

University of Wisconsin - Madison

Computer-aided Study of Stochastic Processes
in the Nervous System



88 3 28 190

(1)

Research Projects *pertained to:*

Project 1: 1) Analysis of single and multiple Stochastic Point Processes;

Investigator: W.S. Rhode

The principal thrust of this research is to study multiple stochastic point processes as recorded in the auditory divisions of the brain of various animals, but principally cat. This is the work of W. Rhode but the technology developed will certainly be utilized by other groups in the Dept. of Neurophysiology. The new, faster computers are an absolute necessity for data collection, analysis and modelling of the data. Various printed-circuit microelectrodes will be tested for recording from 16 to 24 sites in the brain. The responses of these neurons will be studied in response to: 1) pure tones, 2) clicks, 3) noise, 4) amplitude and frequency modulated signals and 5) speech or natural vocalizations.

Project 2: 2) Measurement of basilar and tectorial membrane vibration;

Investigators: W.S. Rhode and C.D. Geisler

The goals of this project are: 1) to measure the effect of traumatizing stimuli such as fatigue, anoxia or ototoxic drugs on basilar membrane motion; 2) to investigate the effect of stimulation of auditory efferents (COCB) on basilar membrane motion; 3) to measure the vibration of the tectorial membrane under the influence of ac and dc potentials. These studies will improve our understanding of fundamental auditory processes by answering some pressing and controversial questions about the micromechanics of the cochlea. This will result in better models of the auditory periphery. Previously, Rhode made many fundamental observations of cochlear mechanics using the Mossbauer effect - a doppler technique. The present measurements will be made in cats and guinea pigs using a laser interferometer which offers improved linearity, frequency response and sensitivity. The execution of this project is heavily dependent on use of a computer-based laboratory.

Project 3: 3) Studies on single auditory nerve fiber responses to speech sounds;

Investigator: C.D. Geisler

The responses of auditory nerve fibers to stop consonants will be studied and related to other properties of auditory nerve fibers such as tuning, and compared to those predicted by a computer model (Geisler's). Invariant characteristics which

appear in the neural responses to 'stops' regardless of vocalic context will be studied. These studies are directed towards understanding how the auditory system represents and processes information in complex stimuli.

Project 4: 4) Models of the peripheral auditory system) 2nd)

Investigator: C.D. Geisler

A computer model of the auditory periphery will be developed. The model will take the acoustic signal reaching the ear and predict the auditory nerve discharge patterns that would be produced by that stimulus. The components of the model include a middle/external ear model, a model of the micromechanics of the organ of Corti, a model of hair cell transduction, and a model of transmitter release of the hair cell/auditory nerve synapse leading to auditory nerve fiber activation. Novel features of the model include longitudinal coupling of elements along the basilar membrane and interactions between the various components in both directions.

Project 5: 5) Study of the pyriform cortex . ←

Investigator: Lewis Haberly

This research is directed at analysis of neuronal mechanisms in the pyriform cortex -- a phylogenetically old, relatively simple part of the cerebral cortex. This cortical area shares many features of organization with the neocortex, but by virtue of its simplicity and unique structural characteristics, it is much more amenable to experimental analysis. The long term goal of this project is the development of a rigorous model for the integrative processes in pyriform cortex. The primary rationale behind these experiments is that a detailed understanding of this simple system will presumably provide general principles applicable to understanding other cortical areas that are functionally more significant but much more complex. Modeling will be carried out in several stages: a) steady-state electronic analysis of single neurons; b) analysis of transient synaptic inputs in single neurons; and c) multi-neuron modeling.

Note: The projects included in the original proposal which were to study anatomical structure and function are not described since no equipment monies were awarded for these projects.

Equipment List (Revised 9/25/86)

Item A Computer System

| | |
|----------------------------------|-------------------|
| Culler PSC (Scientific Computer) | 82,612.50 |
| Sun 3/160 Server node | 17,100.00 |
| ELTEC - disk controller + disk | 7,520.00 |
| Subtotal | <u>107,232.50</u> |

Item B Micro VAX II Computer System for
lab with input terminals

| | |
|--|-----------|
| Digital Equipment Corp.: | |
| Micro VAX II | 38,151.40 |
| National Semiconductor 8MB RAM | 1,256.00 |
| System Industries Controller and Drive | 14,234.23 |
| Ramtek Graphic Display | 14,695.00 |
| Computer Products - Grant Technology A/D | 2,559.50 |
| Tektronics - Ink Set | 1,550.75 |

| | |
|----------------------------|----------|
| UW Medical Electronic Lab: | |
| 16 bit, hi-speed A/D | 2,000.00 |
| PC Controller | 2,000.00 |

| | |
|-----------------------------------|----------|
| American Micro Systems (2) | |
| PC/work station + PC/AT modeling: | |
| AMT 286 clones | 6,689.00 |

| | | |
|--------------------------|----------------------------|-------------------|
| Components for PC/ATs: | | |
| Microway | Turbo-287 | 905.00 |
| BV Engineering | Zeta Sprint Plotter | 662.58 |
| Micro-Tex | PG-640 Matrox PGA graphics | 1,997.25 |
| Votan | Voice Recognition board | 1,873.39 |
| Hallmark Electronics | LABMASTER A/D | 1,256.00 |
| Creative Business System | EGA board | 500.50 |
| Subtotal | | <u>90,330.10</u> |
| Total | | <u>197,562.60</u> |

END

DATE

FILMED

DTIC

JULY 88